

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

PLC Course

مقرر الحاكومات المنطقية البرمجة

Lec 5

29/3/2016

PLC Timers

Timers (Timing Relays)

- Timers are considered to be **relays that provide a delay time** when its contacts position are change from a normal state to a new state (TON) or to return to its normal state (TOF).
- The normal state of these contacts may be normally open (NO) or normally closed (NC).
- There are two main types of timers:

1 - ON-Delay Timer

2- OFF-Delay Timer

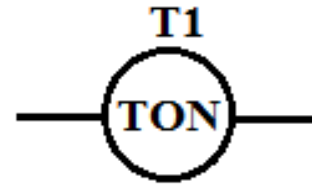
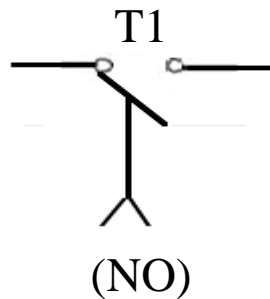
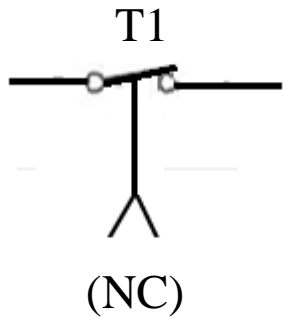


1- ON-Delay Timer (TON)

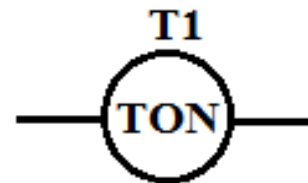
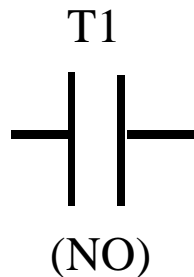
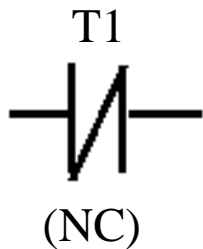
- When the timer coil is energized, contacts will wait for a set time before changing its normal state to a new state (from closed to open or from open to closed).
- When the timer coil is de-energized, contacts return to its normal immediately.

1- ON-Delay Timer (TON)

- Symbols used in relay logic ladder diagram:



- Symbols used in ladder diagram:



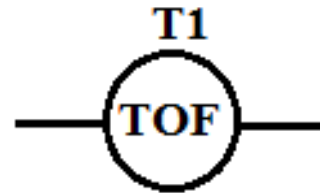
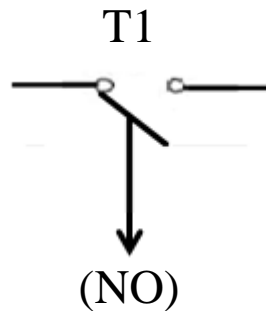
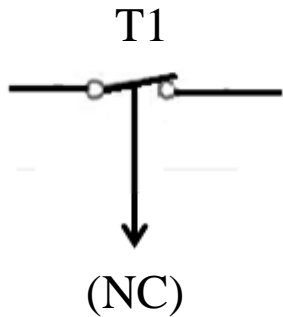


2- OFF-Delay Timer (TOF)

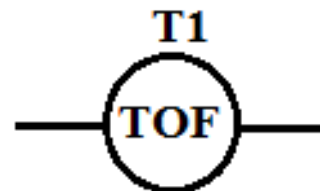
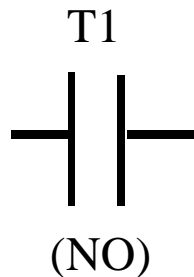
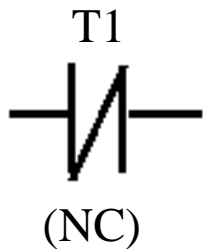
- When the timer coil is energized, contacts change immediately its normal state to a new state (from closed to open or from open to closed).
- When the timer coil is de-energized, contacts will wait for a set time before returning to its normal state.

2- OFF-Delay Timer (TOF)

- Symbols used in relay logic ladder diagram:

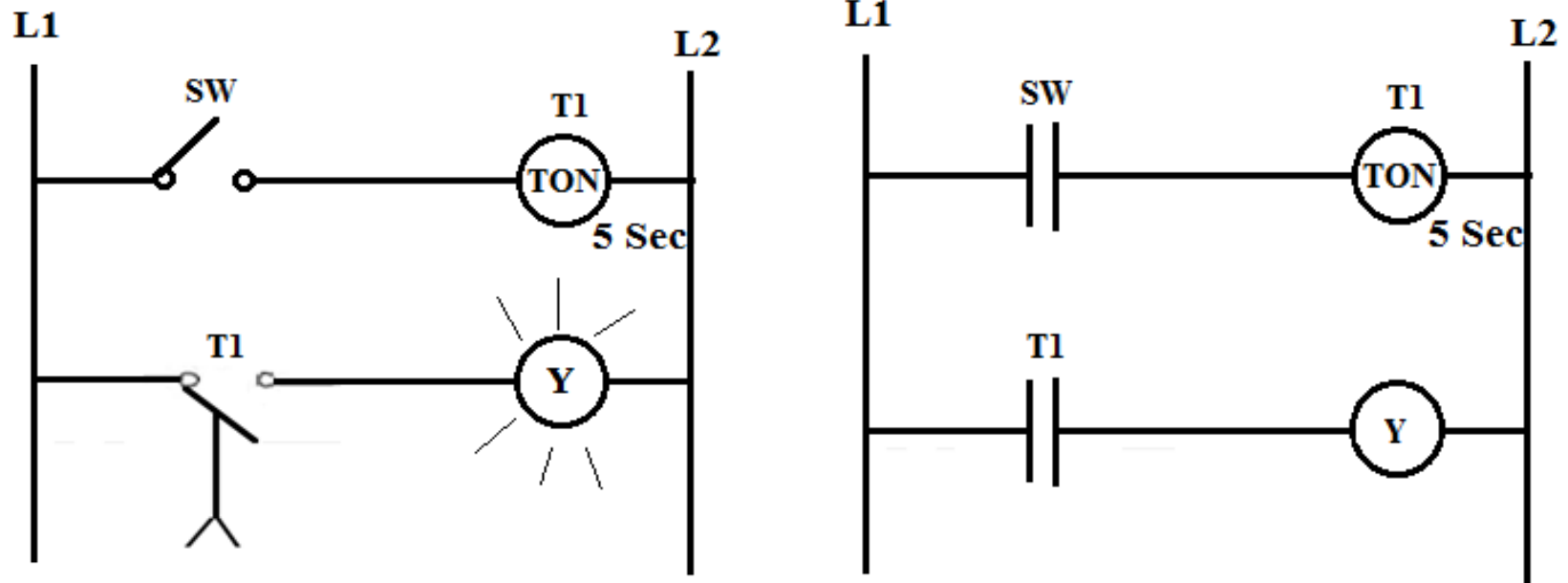


- Symbols used in ladder diagram:



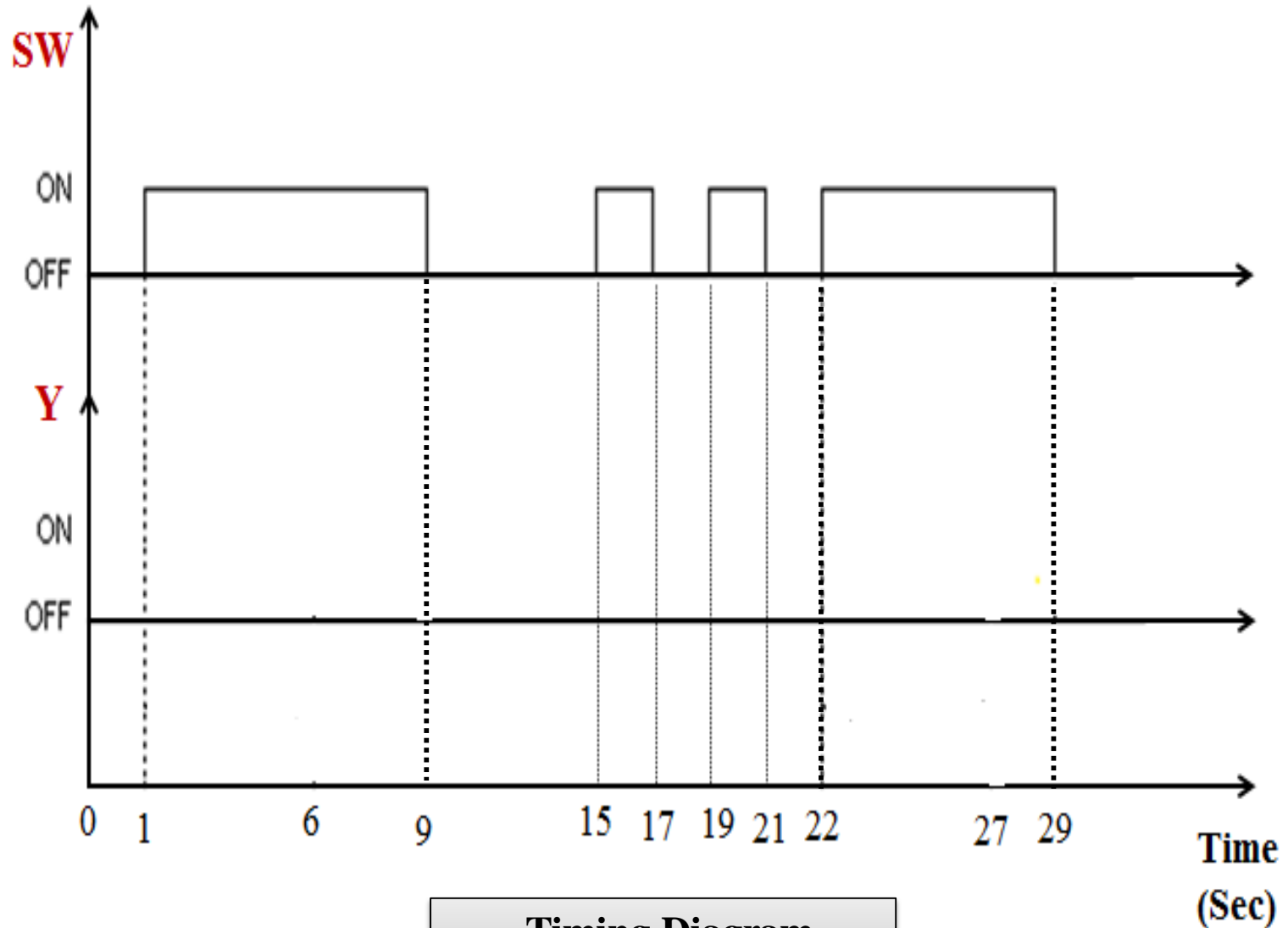
EX1: TON

- For the following diagram:

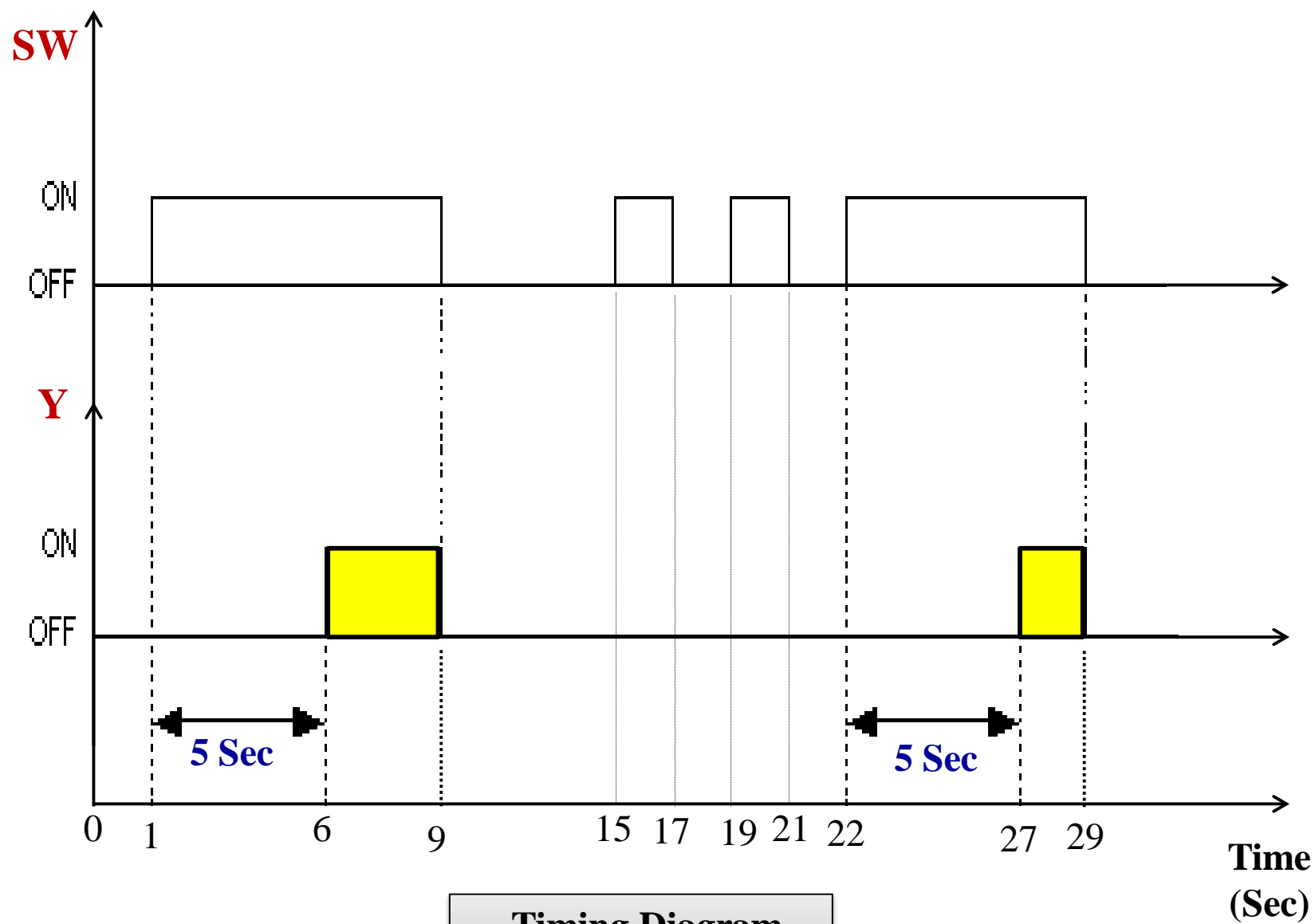


- Using timing diagram, illustrate the operation of the circuit.

Assume that the input switch (SW) has the following state:



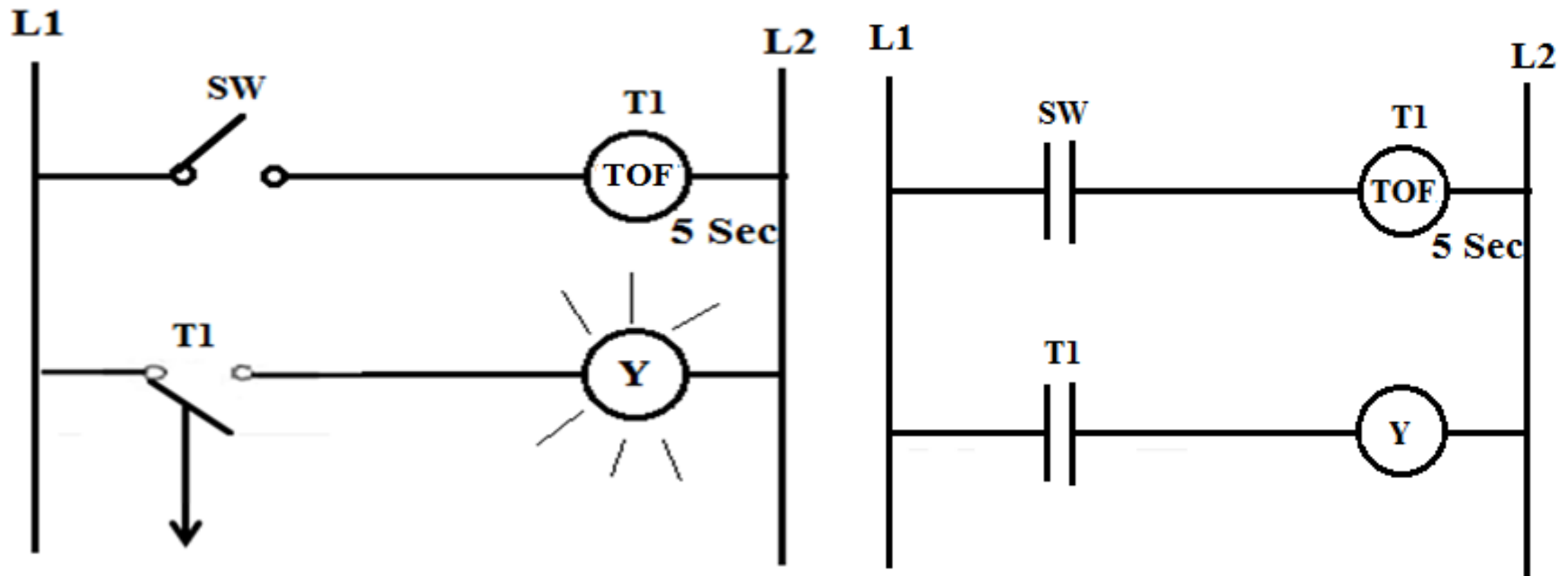
**Timing Diagram
(TON)**



**Timing Diagram
(TON)**

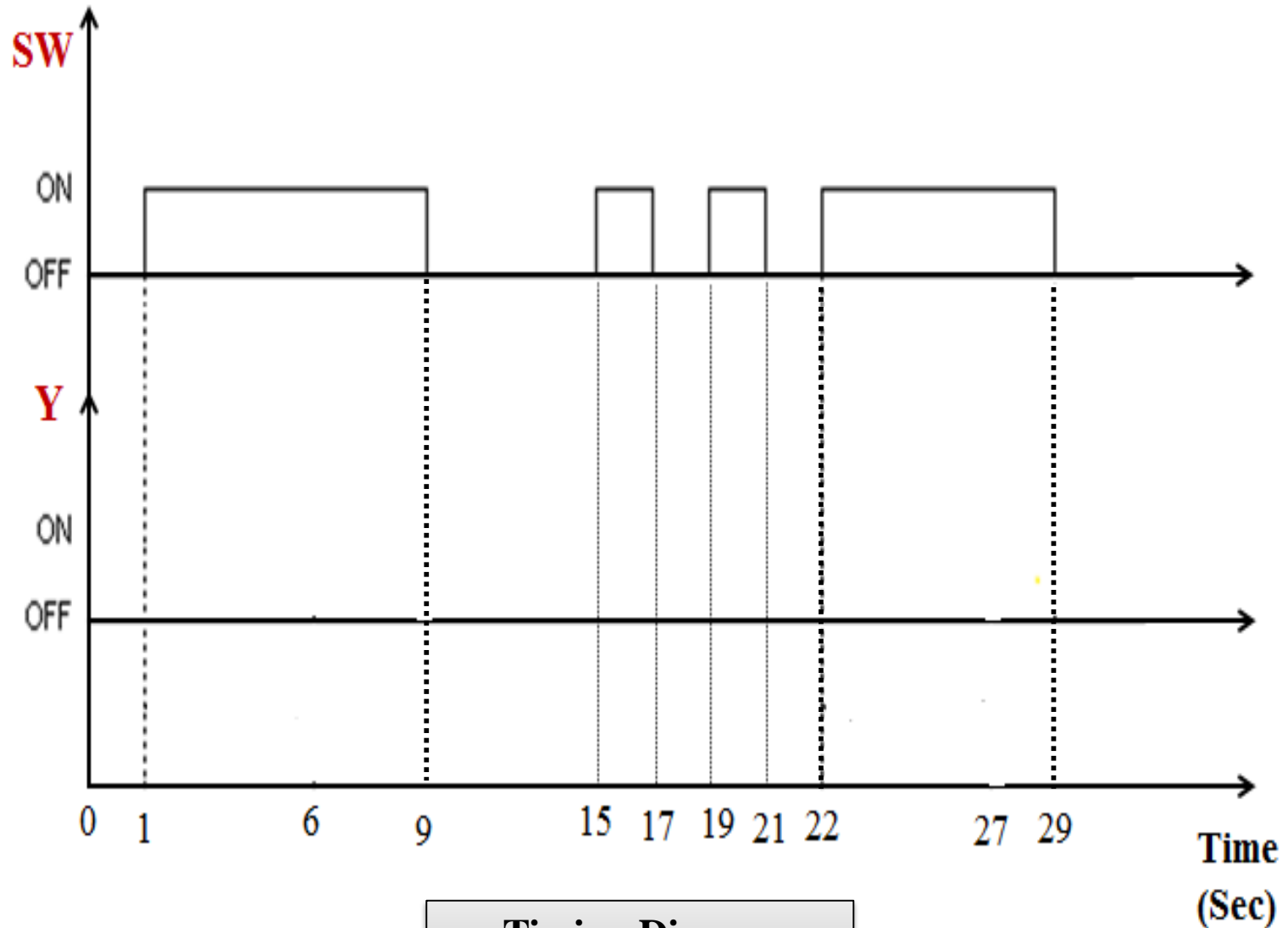
EX2: TOF

- For the following diagram:

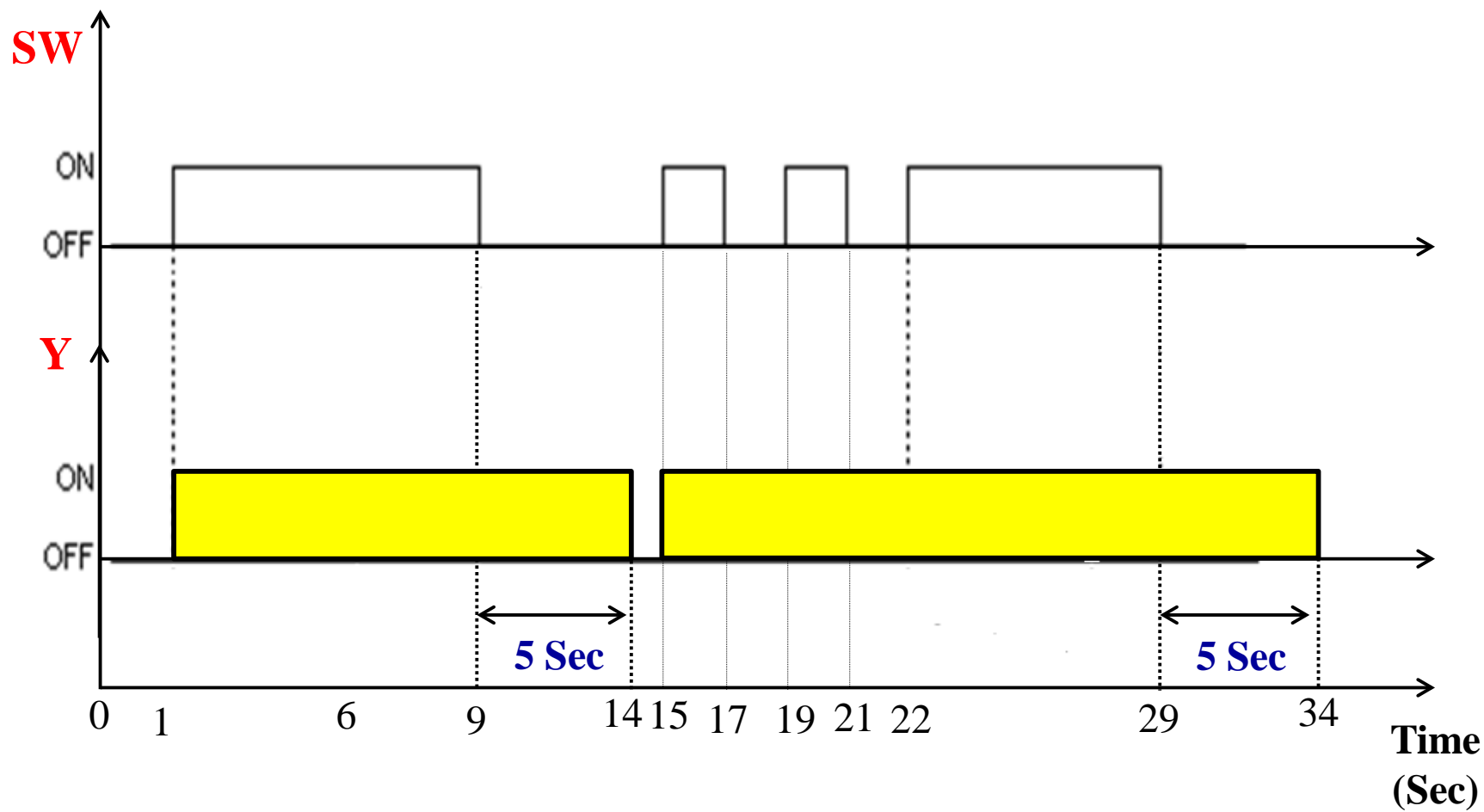


- Using timing diagram, illustrate the operation of the circuit.

Assume that the input switch (SW) has the following state:



**Timing Diagram
(TOF)**



**Timing Diagram
(TOF)**

The Timing Parameters of PLC Timers

- There are three main timing parameters:
- **Timer input parameters (are initialized by the user)**
 - (1) Time Base (TB)**
 - (2) Preset Time (PR)**
- **Timer output parameter (are evaluated by the timer)**
 - (3) Accumulated Time (AT) / Elapsed Time (ET)**

The Timing Parameters of PLC Timers

➤ (1) Time Base (TB):

- TB is the intervals that the timers time out at.
- Time bases are available in fractions and multiples of seconds.

(EX: TB = 0.1 TB=0.01 TB=1)

➤ (2) Preset Time (PR):

- The preset value is the delay time for the timer.
- To find the delay time multiply the time base by the preset value

The Timing Parameters of PLC Timers

➤ **EX:**

- $TB = 0.1$
- $PR = 50$

The delay time = $50 \times 0.1 = 5$ Sec

➤ **EX:**

- $TB = 1$
- $PR = 50$

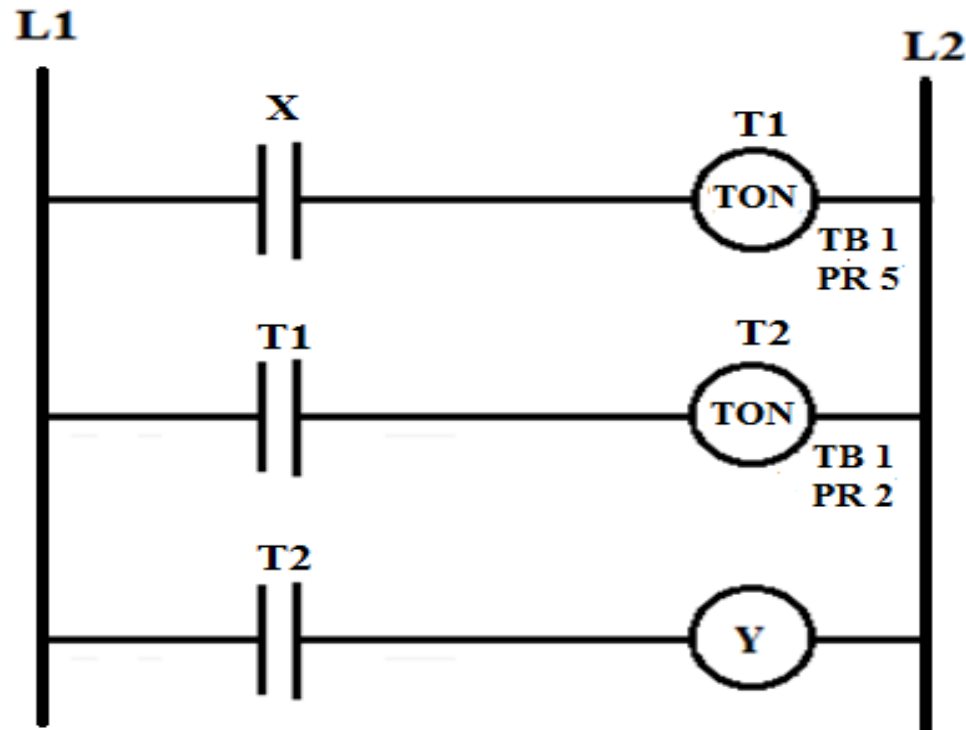
The delay time = $50 \times 1 = 50$ Sec

➤ **(3) Accumulated time:**

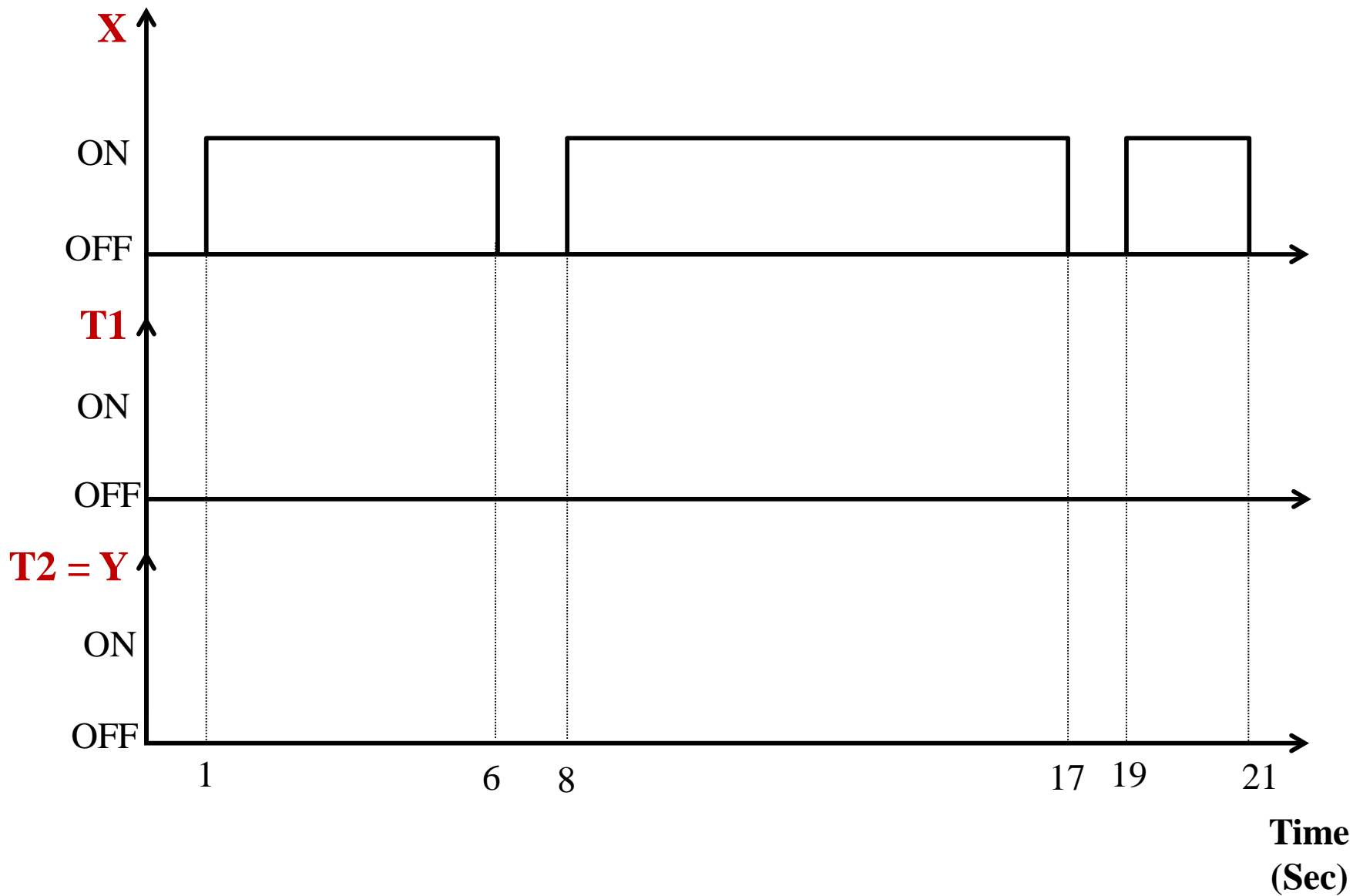
- represents the amount of time that has elapsed from the moment the timing started until the preset value reached.

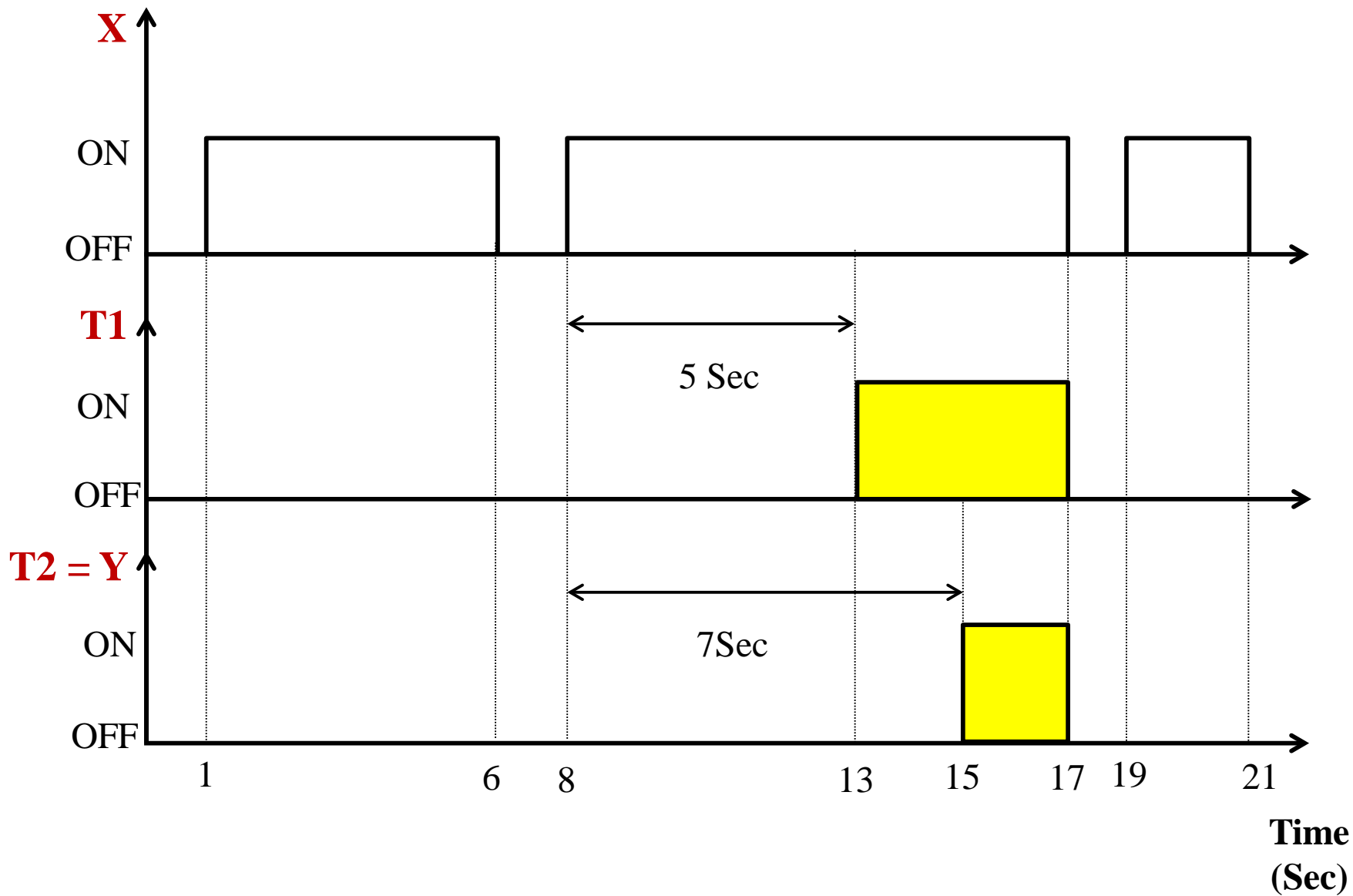
Cascading Timers

- For the following diagram:



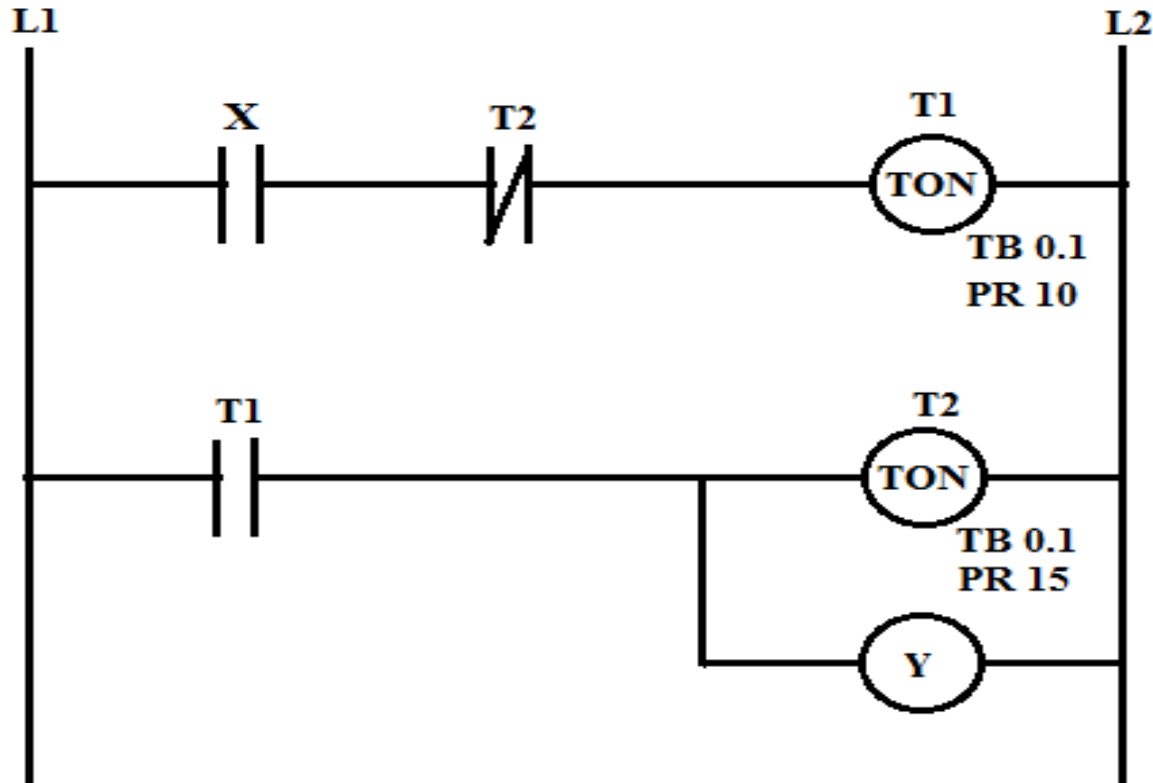
- Using timing diagram, illustrate the states of T1, T2 and Y for the following state of the input switch X:



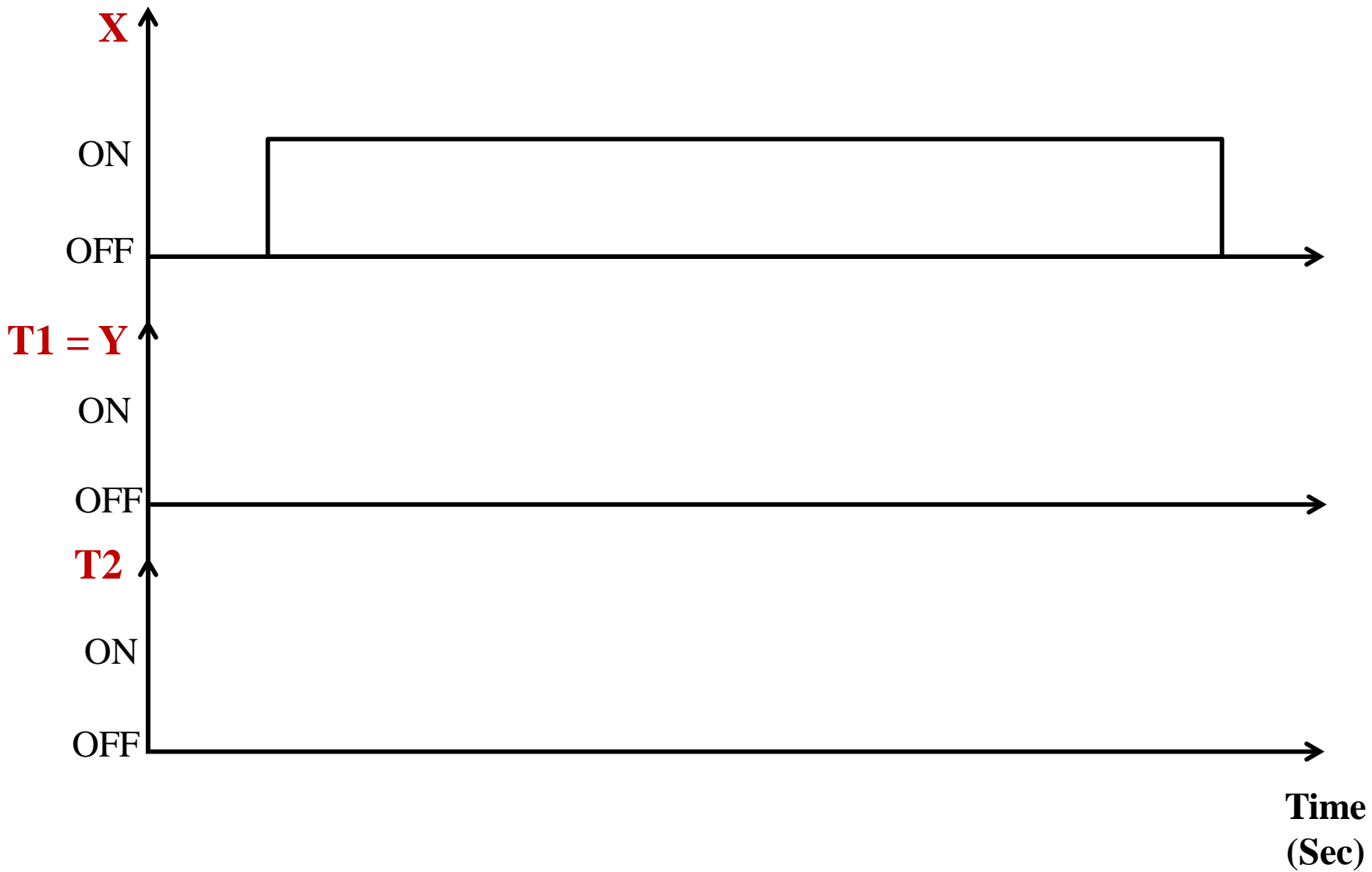


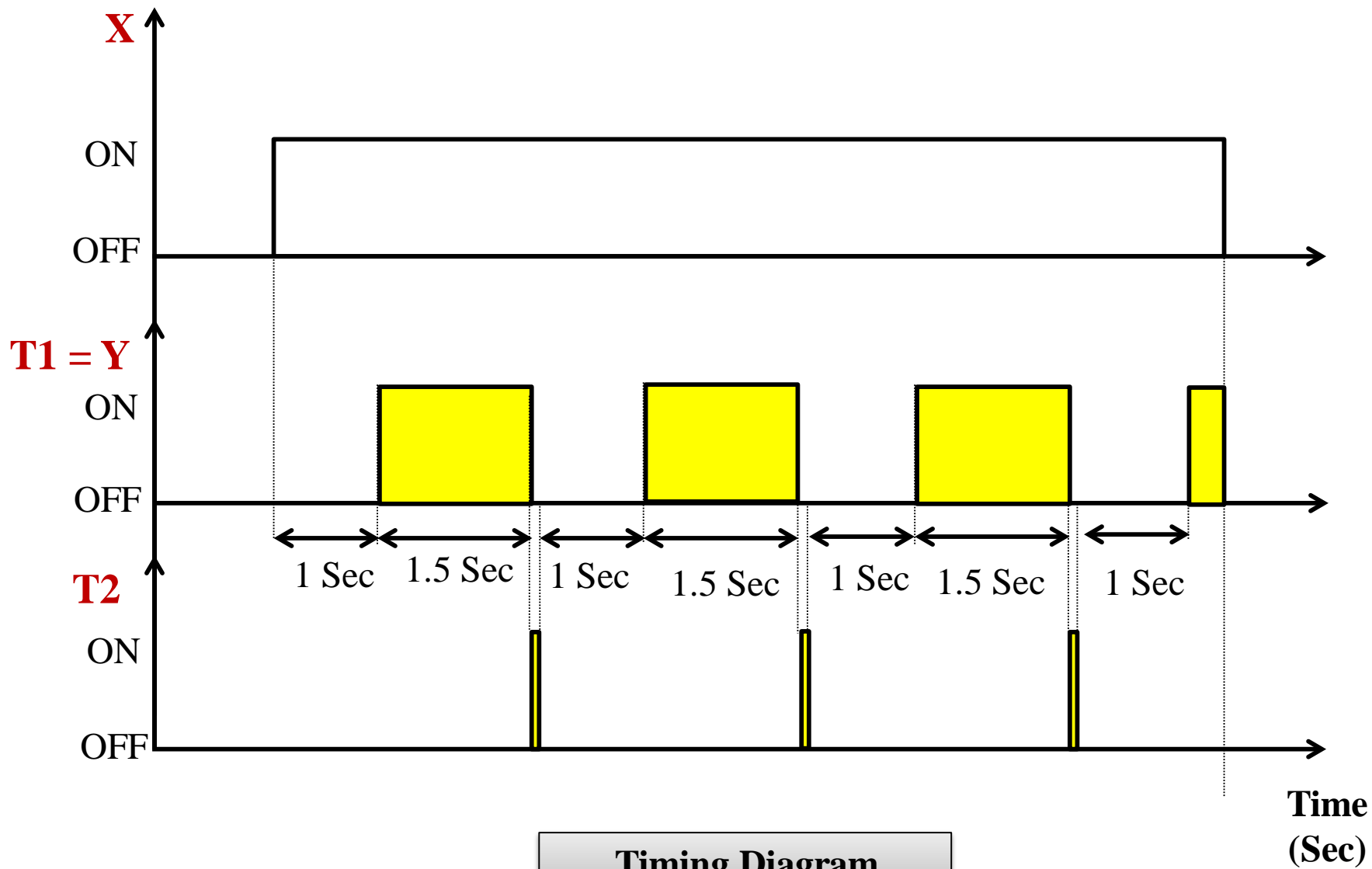
Quiz (1)

- For the following diagram:



- Using timing diagram, illustrate the states of T1, T2 and Y for the following state of the input switch X:

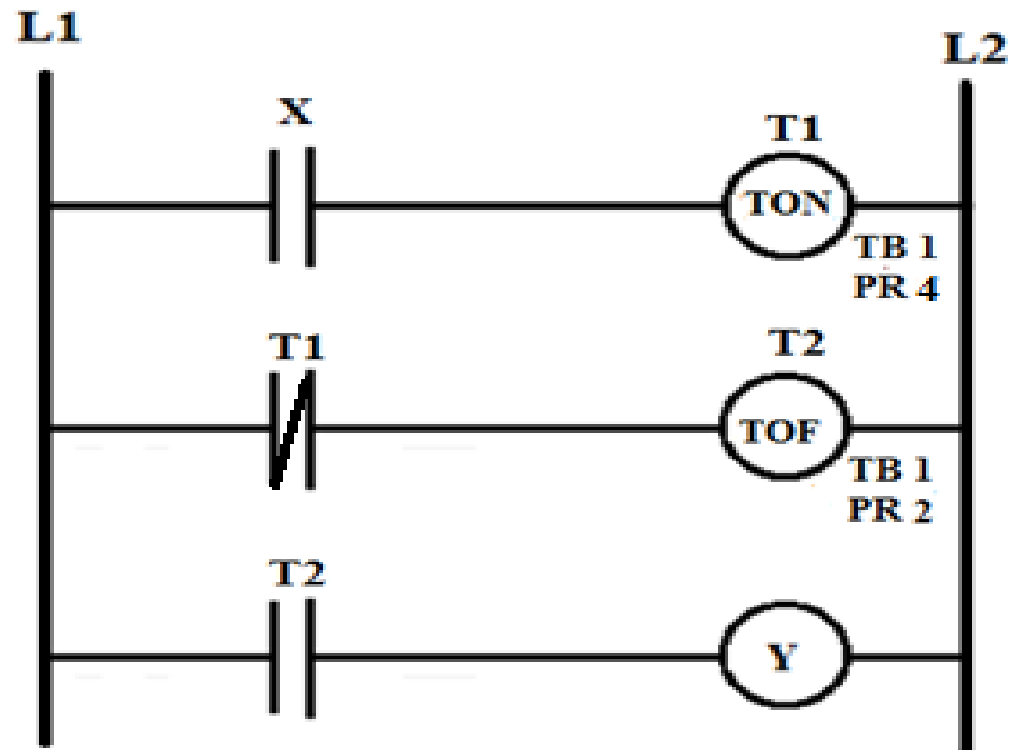




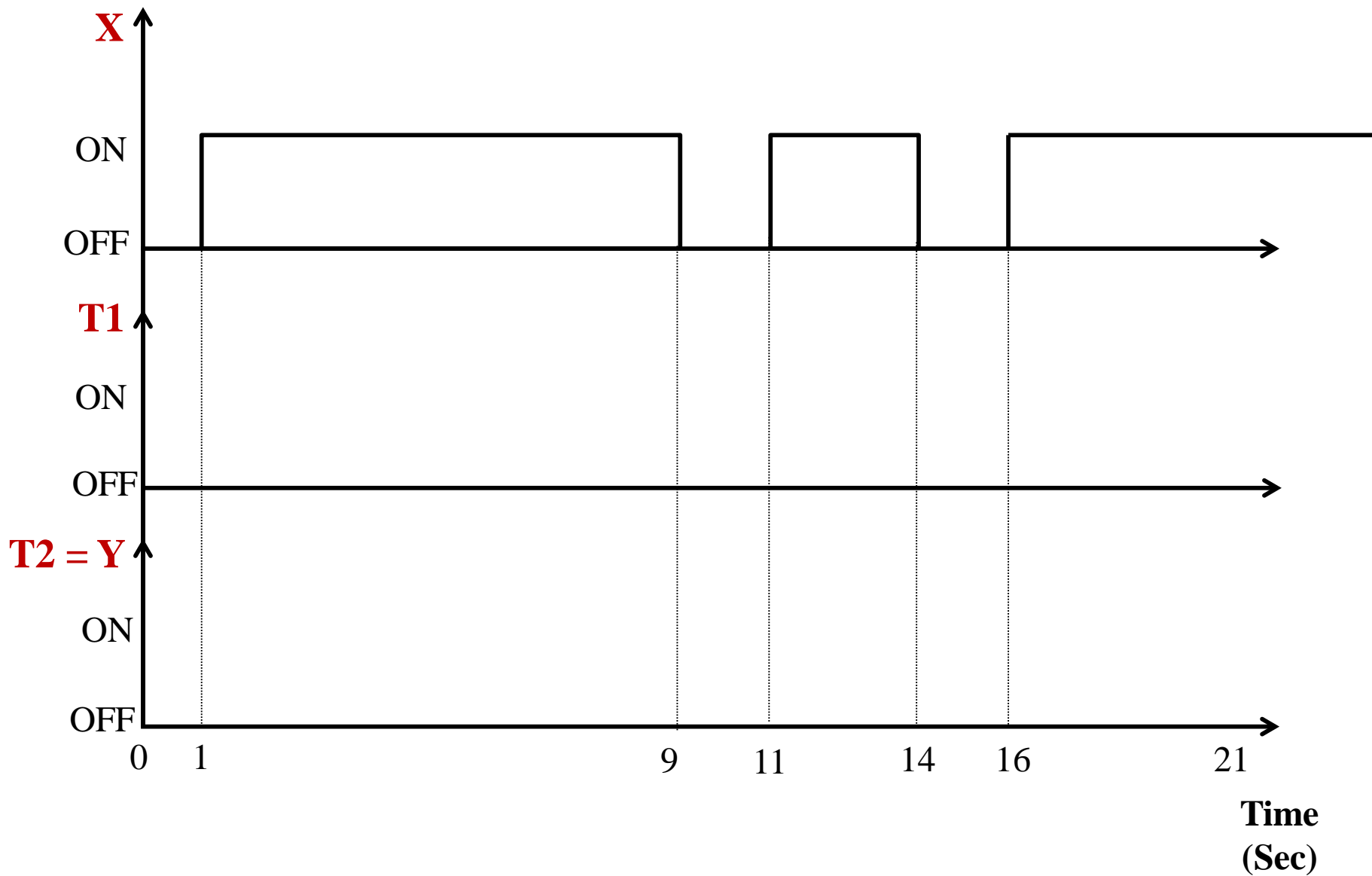
Timing Diagram

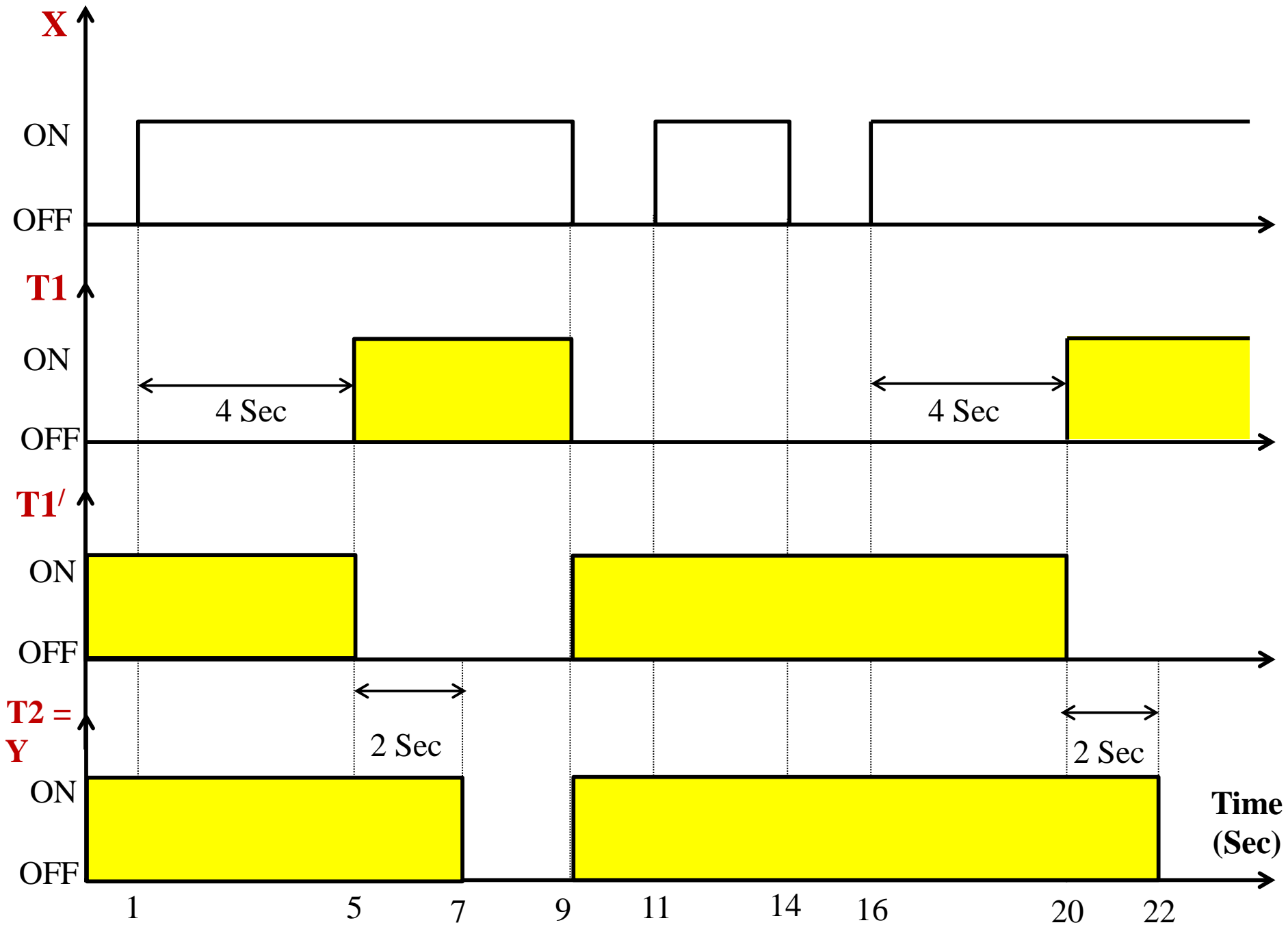
Quiz (2)

- For the following diagram:



- Using timing diagram, illustrate the states of T1, T2 and Y for the following state of the input switch X:





Report

- For the two ladder diagrams shown in Fig.1 and Fig.2, using timing diagram, illustrate the states of CR, T1, T2, M1 and M2. The states of input switches Start, Stop, LS1 and LS2 are shown in Fig.3

Fig.1

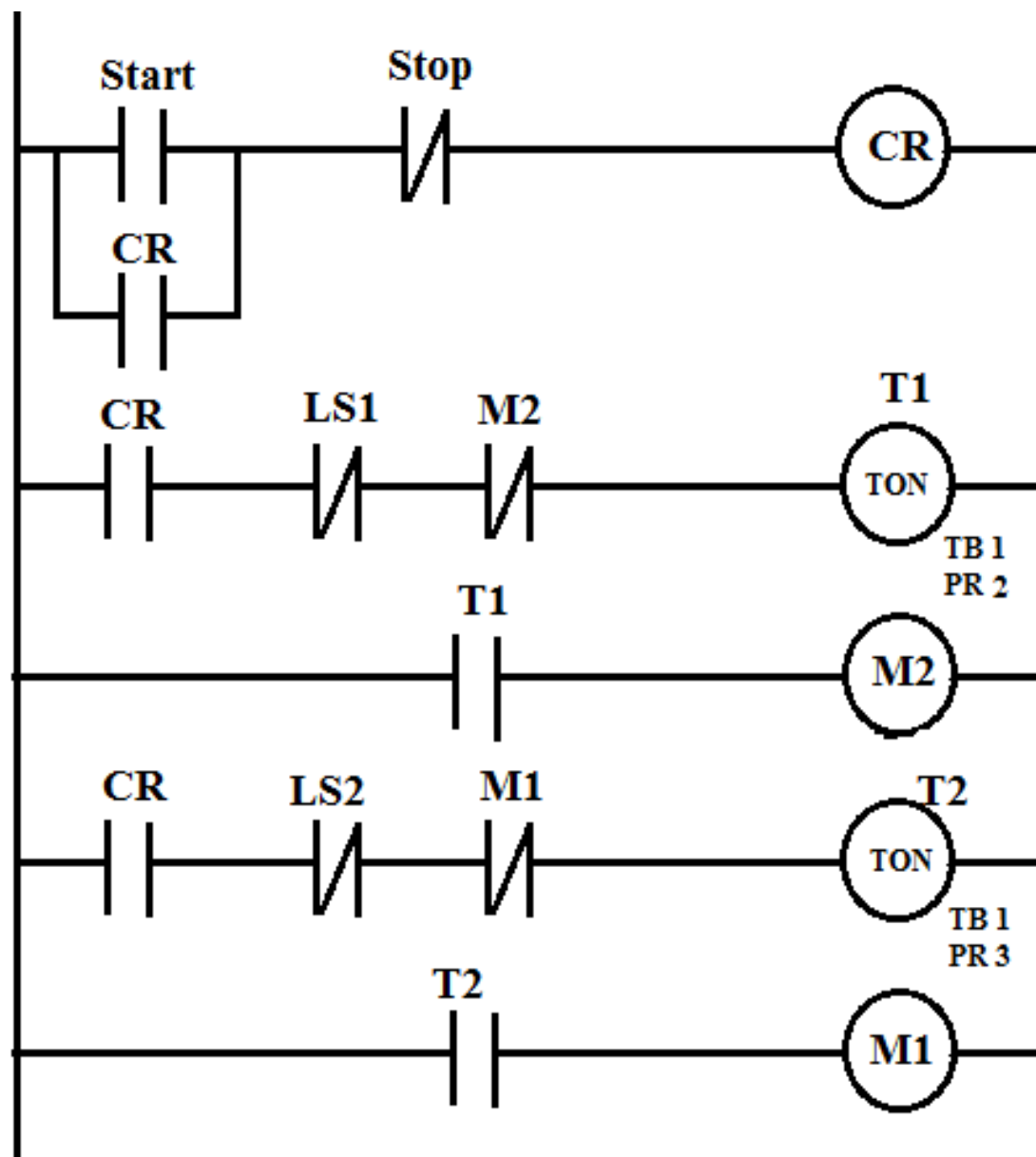


Fig.2

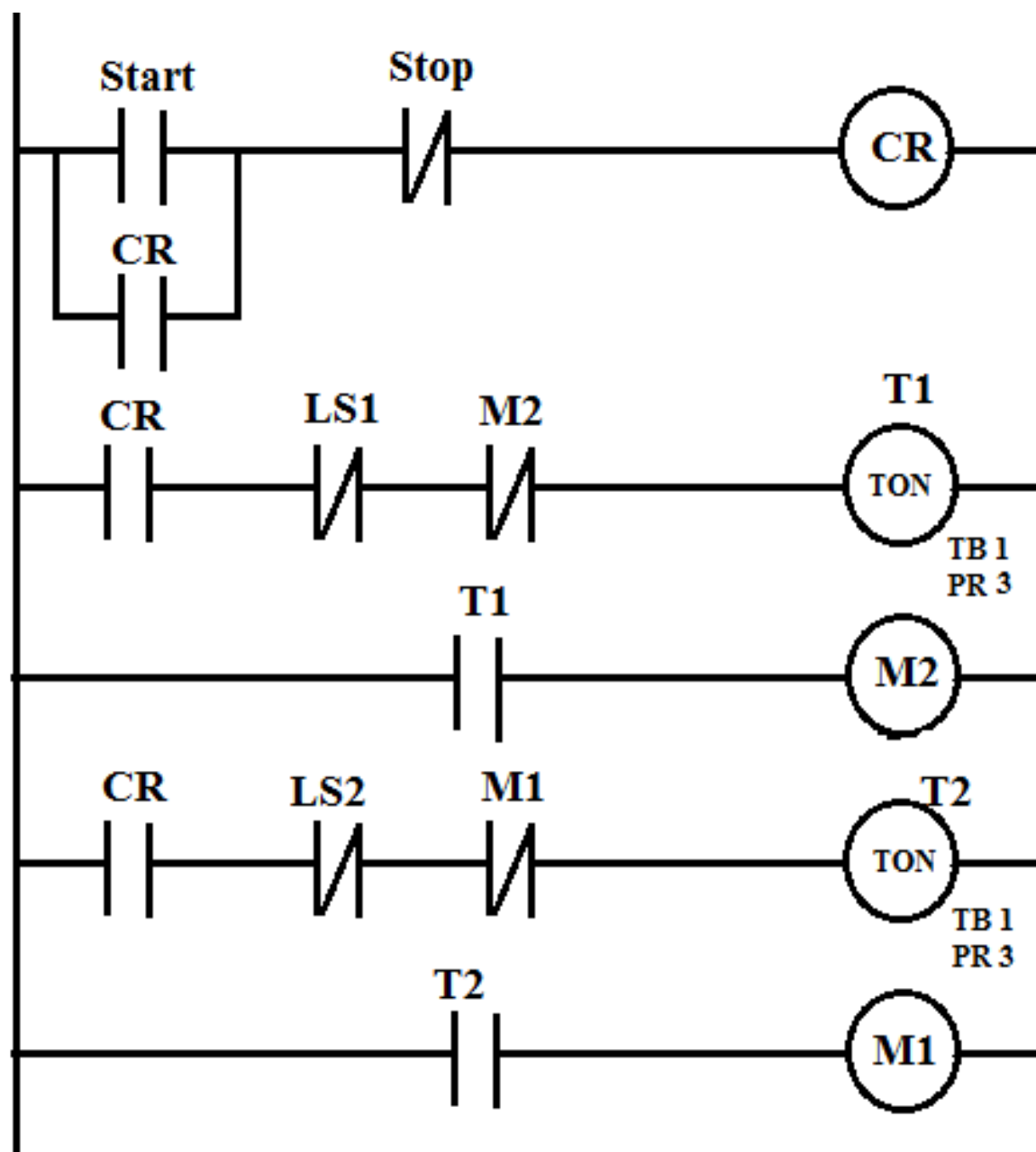
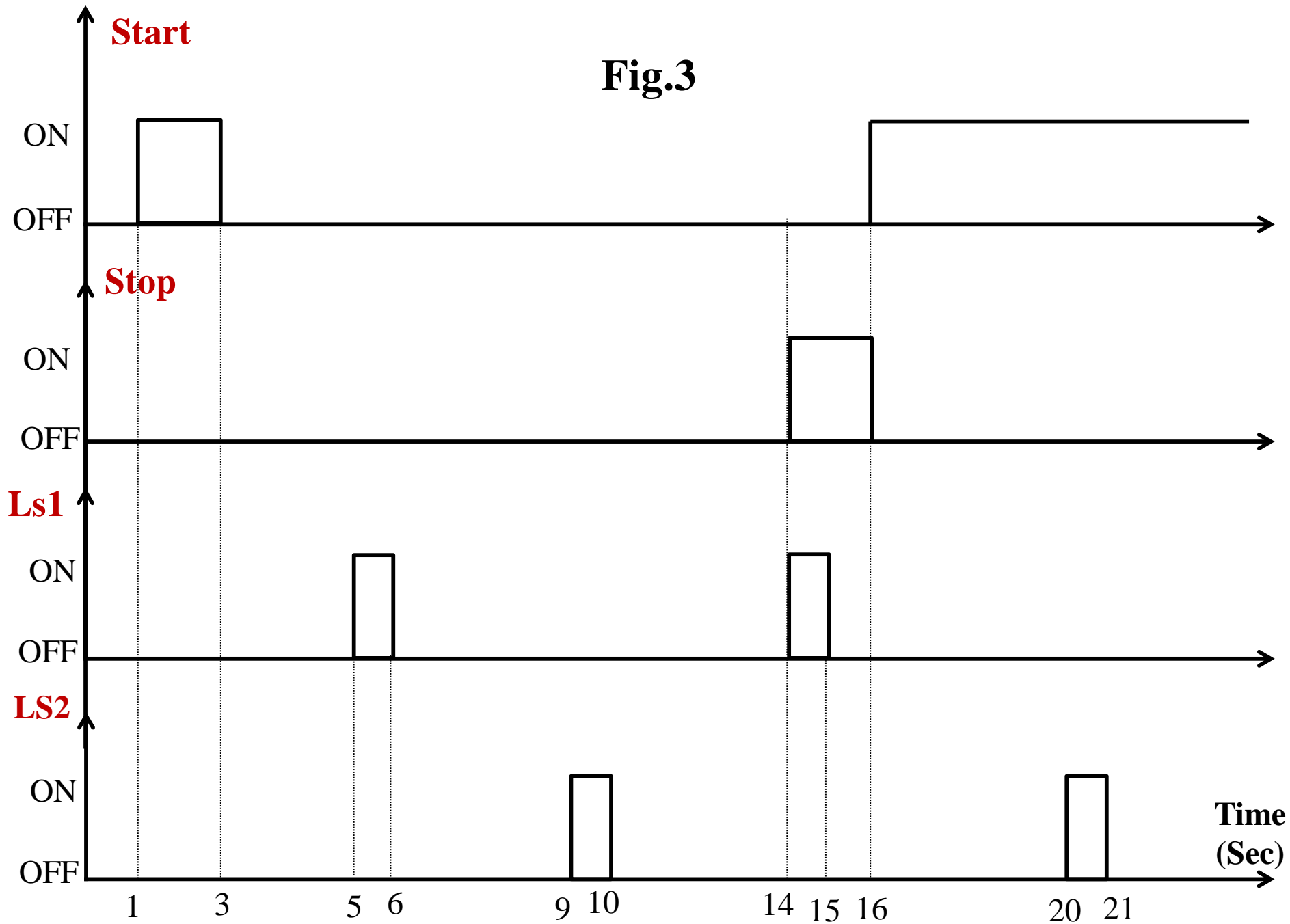


Fig.3



Assign the preset time for LG/GM4 timers

➤ T#ND/H/M/MS/S

EX:

- ✓ T#10s = 10 sec
- ✓ T#2M = 2 minutes
- ✓ T#50MS = 50 msec
- ✓ T#2H = 2 hours
- ✓ T#1M30S = 1 minutes + 30 sec